

Parallel function strategy in pronoun assignment*

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Subjects completed sentences of the form NP1 aux V NP2 because (but) Pro ... (e.g., John may scold Bill because he ...) with a reason or motive for the action described. A basic perceptual strategy was hypothesized to underlie the comprehension of these sentences which have a potentially ambiguous pronoun in the subject position of the subordinate clause. It was expected that listeners would interpret the pronoun as being coreferential with the subject NP of the main clause, the NP with the same grammatical function. While this strategy accounted for the major share of the results, semantic factors restricted its use, establishing an interpretation in which the pronoun was coreferential with the object NP of the main clause.

The factors that influence the assignment of anaphoric pronouns to appropriate referents is a problem of considerable proportions for any model of language comprehension (Quillian, 1968; Winograd, 1972). In many cases the basis of the assignment is quite obvious, as when a pronoun is matched to an available antecedent by features marked explicitly in the surface structure of the sentence. For example, in the sentence:

(1) Mary praised the man because he was courteous.

the pronoun *he* is assigned to the antecedent word *man* because of the critical feature (male) that is common to them. In other cases, the basis of the pronoun assignment is not so obvious. Consider a situation in which the pronoun can be coreferential with either the first or second noun phrase:

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- (2) George telephoned Walter because he wanted some information.
 (3) George criticized Walter because he misplaced the file.

Although these sentences have at least two underlying representations, subjects seem to prefer one reading over another (Garvey, Caramazza and Yates, 1975).

Garvey and Caramazza (1974) suggest that a property of some verb roots, direction of causality, is involved in the process of pronoun assignment in these latter sentences. This feature, implicit in certain verbs, imputes the cause of an event or situation either to the subject or object of the clause in which it serves as a main verb. Thus, the causal feature of the verb *telephone* in sentence (2) establishes a preferred interpretation in which the pronoun *he* is coreferential with the first noun phrase (NP1 = George) while the causal feature of the verb *criticize* in sentence (3) biases the selection towards the second noun phrase (NP2 = Walter) as the antecedent of the pronoun. The direction of causality for a set of verbs was assessed by a sentence completion task that required subjects to provide a reason or motive for the action described in sentence fragments of the form *NP1 V NP2 because pro ...* (Garvey et al., 1975). Verbs produced a consistent bias in the direction of pronoun assignment ranging from verbs which strongly determine the choice to the first noun phrase (NP1), e.g., the verb *apologize*, to verbs which strongly restrict selection to the second noun phrase (NP2), e.g., the verb *fear*. These results can be rendered more meaningful when we consider that part of what we understand about apologizing includes the knowledge that the motive arises primarily from within the person making the apology, thereby biasing the choice towards NP1. In other words, part of the meaning of *apologize* is the presupposition that the person performing the act of apologizing is responsible for some prior negative action in relation to the person to whom he/she is apologizing. This is not to say, however, that the reasons for apologizing are part of the meaning of *apologize*. In contrast to the presuppositions of apologizing, what we understand about fearing includes the knowledge that there exists a threat of impending danger outside the fearer, thereby biasing the choice towards NP2. Not only does the implicit causality feature determine the direction of pronoun assignment in a sentence but it also facilitates the choice of an appropriate antecedent in a timed comprehension task (Caramazza, Grober, Garvey and Yates, 1977).

Subjects were required to decide the coreferentiality of a pronoun in pairs of sentences such as *John telephoned Bill because he withheld some information/wanted some information*. Verbs were first empirically classified into those that bias assignment towards the first noun phrase of the main clause and those that bias assignment towards the second noun phrase. Pairs of

sentences were constructed for each verb such that the subordinate clause in one sentence established a reading consistent with the natural bias of the verb while the others established a reading inconsistent with the bias of the verb. Time to respond was faster for the congruent sentences. This was also true for control sentences such as *Sue telephoned Bill because he withheld some information* in which gender differences eliminated all potential ambiguities.

The results, considered together, indicate that subjects regularly make use of implicit causality relations marked by verbs in determining the selection of antecedents for ambiguous pronouns. Moreover, the influence of the implicit causality feature can be modulated by other linguistic variables (Garvey et al., 1976). For example, passivization, which reverses the surface order of the logical subject and object of the sentence, resulted in a general drift in the assignment of pronoun antecedents toward the grammatical subject of the sentence. That is, NP2 type verbs (e.g., *criticize*) in the active voice maintain the deep structure NP2 antecedent in the passive voice although the surface structure assignment is NP1. This can be seen in sentences (4) and (5).

(4) The director criticized the actor because he forgot his lines. (NP2)

(5) The actor was criticized by the director because he forgot his lines.
(Surface NP1 = deep NP2)

The introduction of negation on the assignment of pronoun antecedents had a similar though much weaker effect. There was a general shift in positive sentences from preference for NP2 assignments toward NP1 assignments in negated sentences. A sentence fragment such as *The doctor blamed the intern ...* elicited statistically significant NP2 responses while the fragment *The doctor did not blame the intern ...* produced only a trend toward NP2 responses.

In general, the effect of these syntactic factors on the direction of causality implicit in the verbs was to produce a preference for pronoun assignment to the grammatical subject or sentence initial NP. This preference is consistent with Sheldon's (1974) speculation about the role of parallel function in pronominalization: a pronoun in the second conjunct of a complex sentence is interpreted as being coreferential with the NP that has the parallel grammatical function in the first conjunct. In sentence (6)

(6) John hit Bill and he kicked Sam.
i i

the reference of the pronoun is determined by parallel function; the pronoun is assigned to the subject NP in the preceding conjunct. When NP'S

which do not have the same grammatical function are interpreted as being coreferential, as in sentence (7), the result is much less acceptable. However,

(7) John hit Bill and then he kicked Sam.
 i i

a change in the usual interpretation can be signalled by placing contrastive stress on the pronoun as in sentence (8). The pronoun no longer refers to the subject NP in the preceding conjunct but to the object NP.

(8) John hit Bill and then he kicked Sam.
 i i

Further support for the role of parallel function in pronominalization can be garnered from Halliday's distinction between theme and rheme in the analysis of clauses (Halliday, 1967). The distinction is realized by the sequence of elements in a clause: the theme comes first. The theme is the person or thing being talked about, the psychological subject. Often, the theme of the subordinate clause is presumed to be the same person who functions as the theme of the main clause. Thus, when a listener is confronted with a potentially ambiguous sentence fragment of the form used in the present study, he invokes a strategy that identifies the theme of the subordinate clause with that of the main clause. In terms of the Parallel Function Hypothesis (PFH) since *the pronoun following the subordinate conjunction is the grammatical subject of that clause, it will be interpreted as being coreferential with the grammatical subject or sentence-initial NP of the main clause.*

It is our contention that listeners rely on this general strategy to interpret sentences with potentially ambiguous pronouns in the first position of a subordinate clause. While the explanatory power of any general strategy may be quite adequate to account for a major share of the results, it will not work all the time. Manipulation of the semantic content of the sentence fragments may affect pronoun assignment in very regular ways. We already know that one restriction on our proposed strategy for pronoun assignment arises from the causal valence of the verb (Garvey, et al., 1975). When the verb imputes the cause of an event to the object NP, a preferred interpretation is established in which the pronoun is coreferential with the object NP, violating the proposed general strategy.

In an effort to test the limits of the PFH strategy for pronominalization, we added two semantic variables to the sentence fragments subjects were asked to complete. First, the verb phrase was expanded by including a modal auxiliary verb. Second, the two clauses in half of the sentence fragments were joined by the connective *but* rather than *because*. It was expected that

these manipulations would affect the proposed strategy in systematic ways and at the same time reveal other semantic variables, besides implicit causality, that could restrict its use. The specific predictions are elaborated in the following section.

Semantic Variables

Main Verbs

The main verbs used in the sentence fragments were selected from the subset of English verbs that reference various types of interpersonal relationships involving judgments of worth and responsibility (Fillmore, 1971). Several of these “verbs of judging”, *criticize*, *scold*, and *praise*, had previously been characterized as NP2 types (Garvey et al., 1975). Pilot work indicated that one other verb, *forgive*, was also an NP2 type and two others, *apologize* and *accuse*, were NP1 types. Similarities in the presuppositional and illocutionary aspects of these verbs were discussed by Fillmore (1971), but it was uncertain whether these similarities would be implicated in pronoun assignment in the present task. It should be noted, however, that one presupposition implicit in verbs of judging – whether or not the situation or action described is favorable, (e.g., *praise*) or unfavorable, (e.g., *criticize*) – was not an important factor in determining response bias (Garvey et al., 1975). It was found that both *criticize* and *praise* elicited strong NP2 responses.

Modal Verbs

The main verb in each sentence fragment was modified by a modal auxiliary verb. The expansion of the verb phrase with a modal was expected to affect the PFH strategy for pronoun assignment in specific ways. Before describing these predictions, it is useful to consider a problem unique to modal verbs in English. What is the relationship between the meanings of *must* in (9a) and (9b)?

- (9a) You must be very careless.
- (9b) You must be very careful.
- (9c) You must be very sympathetic.

The dominant reading of *must* in (9a) means approximately “it is obvious that” whereas in (9b) it means “you are required to be”. Frequently the word *must* can be easily interpreted in either sense as in (9c). The first of its meanings (9a) represents the speaker’s assessment of the probability of what he is saying. This use of modality derives from what Halliday (1967)

calls the interpersonal function of language which sets up the role relationship between speaker and hearer. The second use of modality (9b) is ideational in function, part of the meaning of the clause, and is related to the speaker's experience of the real world. It expresses the factual conditions on the action expressed in the clause. The distinction between the two uses of modality corresponds respectively to the difference between the epistemic and root interpretations of modal verbs drawn by other linguists and philosophers (e.g., Antinucci and Parisi, 1971; Lakoff, 1972; Von Wright, 1951).

In spite of the complex syntactic differences between them (see Halliday, 1967 for a thorough discussion), both senses can be subsumed under a single semantic classification system (Halliday, 1969). The epistemic notions of "probable or if not, then either possible or certain" can be equated with the root notions of "willing or if not, then either permitted or compelled". The contrast of importance for the present study is that between strong modal auxiliary verbs (*must, ought to*) expressing necessity (certainty) and weak modal verbs (*can, may*) expressing permission (possibility). The two other modals used, *will* and *should*, have both a weak and a strong interpretation (Leech, 1970).

Armed with this classification system, we can now speculate about the effect of modality on the PFH strategy for pronoun assignment. It was expected that the expansion of the verb phrase with a weak modal would attenuate the causal valence of the main verb. That is, reducing the likelihood of the action expressed in the main clause by including a weak modal, diminishes the importance of the antecedent event as a motive for the action. Whether the action is attributed to the subject or to the object noun should no longer restrict pronoun assignment. Instead, the subject is free to rely on the PFH strategy in which the pronoun is assigned to the sentence initial NP. A very different result is expected when the verb phrase is expanded with a strong modal. The causal valence of the main verb should be augmented with a concomitant restriction on the application of the PFH strategy. That is, requiring that the action expressed in the main clause be carried out increases the salience of the antecedent causal event as a motive for the action. Thus, the causal valence of the verb rather than our proposed strategy, should be the primary determinant of pronoun assignment.

The use of weak and strong modal auxiliaries may affect more than just pronoun assignment. It is also possible that a sentence fragment containing a strong modal may evoke an explanation for the action that is more compelling than if the sentence fragment contained a weak modal (Dakin, 1970). The rated "compellingness" of the explanations that are generated by subjects should be consistent with the semantics of the modal verbs as presented by Antinucci and Parisi (1971) and Halliday (1967).

But vs. Because

The other semantic variable that was expected to affect the proposed strategy for pronoun assignment was the use of the connective *but*, in addition to *because*. The use of one or the other of these subordinate conjunctions determines what will be considered an acceptable completion for a sentence fragment (Dakin, 1970). The sense of *because* invoked in the present task results in a description of some antecedent event or current state of affairs that, through known rules or conventions, can be considered a cause of the behavior asserted in the main clause. In contrast, *but* introduces a statement of what has happened which usually is the opposite of what might be expected on the basis of the behaviour described in the main clause. These differences in the nature of acceptable completions for *but* and *because* sentences may have very real consequences for our proposed strategy of pronoun assignment. Data from the Garvey et al. study demonstrate the importance of implicit causality in determining pronoun assignment for *because* sentences; the strategy of assigning the pronoun to the grammatical subject of the main clause will be blocked when the cause of the action is imputed to the object NP. For *but* sentences, however, the causal valence of the verb may have little effect on pronoun assignment. That is, the semantics of *but* could lead listeners to simply generate explicit denials of the action expressed in the main clause (Lakoff, 1971), maintaining a parallel construction in the subordinate clause. Thus, the pronoun would be assigned coreferential with the subject NP regardless of the direction of causality implicit in the verb, thereby supporting the proposed strategy for pronoun assignment.

Method*Subjects*

One hundred and twenty-eight volunteer students from The Johns Hopkins University participated in the experiment.

Materials

Test booklets consisted of 60 sentence fragments of the format: *NP1 aux V NP2 because (but) Pro...* Thirty-six of these were test items in which there were no grammatical cues available to assist pronoun assignment to either NP1 or NP2, e.g., *John must scold Bill because he...* The 24 distractor items, which were interspersed among the test items, did provide grammatical cues, e.g., *Mary must telephone Sam but she...*

Test items were constructed by combining every main verb: *apologize*, *criticize*, *accuse*, *praise*, *forgive*, and *scold*, with every modal auxiliary: *must*, *ought to*, *will*, *should*, *may*, and *can*. Each of the resulting 36 sentence fragments were then transformed to provide a set of 8 sentences that contrasted on a) voice: active vs. passive; b) verb polarity; positive vs. negative; and c) conjunction: but vs. because. Different sets of 36 test items were selected from the 288 items with the constraint that only 6 sentences for each main verb appear in a test booklet. No attempt was made to equate the 36 test sentences for voice, verb polarity, modality, or conjunction. Order of the pages in a test booklet was randomized so that no two subjects saw the same set of 60 sentences in the same order.

Procedure

Subjects were tested individually and worked at their own pace. They were told to complete each sentence, writing a reason or motive that was appropriate for the action presented in the first part of the sentence.

Results

Data from the passive and verb negated sentences were not included in the following analyses. The results were similar to those reported in Garvey et al., 1975.

Response sheets were scored independently by two judges. Disparities in scoring between them occurred for 8% of the responses; these were then arbitrated by a third judge. Scoring consisted of judging the completed sentence as indicating either NP1 or NP2 assignment of the pronoun in the second clause. Judges also scored a response as ambiguous (A) if it was not clearly interpretable as NP1 or NP2; as unintelligible (U) if illegible or if it indicated lack of understanding of the test item; or as no response (NR). The last three scoring categories did not appear to be systematically distributed in relation to test items and were omitted from further analysis. Total number of possible responses was 1160: 6% of these were scored as A+U+NR responses. The NP1 and NP2 type completion data are presented separately for the contrasts of conjunction and modality.

But-Because

Table 1 presents the number of surface NP1 and NP2 assignments for both the *but* and *because* sentences for each verb separately. As can be seen from

the distribution of NP1 and NP2 responses, type of connective influenced the assignment of pronoun antecedents ($\chi^2 = 190.45$, $p < 0.001$), with *but* sentences eliciting significantly fewer NP2 assignments than *because* sentences. This was confirmed in separate comparisons for each verb ($p < 0.001$ in all cases) with the exception of *apologize*, a strong NP1 type verb. Moreover, the number of NP2 assignments for *but* sentences did not vary substantially across particular verbs. Thus, it appears that direction of causality implicit in the verbs had little effect on pronoun assignment for *but* sentences. Subjects simply generated an explicit denial of the action with the pronoun referring to the grammatical subject of the main clause.

Table 1. *Completions for Because and But Sentences*

<i>Verb</i>	<i>Because</i>		<i>But</i>		<i>p</i> ≤
	<i>NP1</i>	<i>NP2</i>	<i>NP1</i>	<i>NP2</i>	
<i>apologize</i>	92	9	85	8	n.s.
<i>accuse</i>	64	35	79	6	0.001
<i>forgive</i>	36	37	89	10	0.001
<i>criticize</i>	34	55	93	7	0.001
<i>praise</i>	26	53	82	9	0.001
<i>scold</i>	27	66	74	15	0.001
Total	279	255	502	55	0.001

The pattern of pronoun assignments for *because* sentences is consistent with earlier results (Garvey et al., 1975). The direction of causality implicit in each verb is a salient factor in the determination of antecedent assignment. The verbs *apologize* and *accuse*, which had been identified previously as NP1 type verbs, had fewer NP2 responses than the verbs *criticize*, *praise*, *forgive*, and *scold*, which had been identified previously as NP2 types. Since the semantics of causality is implicated in pronoun assignment for complex clauses joined by *because*, while the semantics of *but* appears to influence pronoun assignment for complex clauses joined by *but*, separate analyses were carried out for *but* and *because* sentences.

Modality

In order to assess the effect of modality on pronoun assignment, we considered only those sentences containing modal auxiliaries that could be unambiguously classified as strong (*must*, *ought to*) or weak (*can*, *may*).

Table 2 presents the number of NP1 and NP2 assignments for each main verb when combined with a strong or a weak modal in clauses joined by *because*. As can be seen from the distribution, type of modal influenced the assignment of pronoun antecedents ($\chi^2 = 20.53$, $p < 0.001$), weak modals producing a shift toward NP1 assignments. More specifically, NP2 type verbs (*criticize*, *forgive*, and *scold*) appeared as strong NP1's when modified by a weak modal and as strong NP2's when modified by a strong modal ($p < 0.05$ in all cases). *Praise*, an NP2 type, and *apologize*, a strong NP1 type, remained unchanged when modified by either a strong or weak modal.¹ *Accuse*, the other NP1 type verb, appeared as a stronger NP1 when modified by a weak modal although the effect was not significant.

Table 2. *Completions for Strong and Weak Modal Verbs in Because Sentences*

Verb	Strong		Weak		$p \leq$
	NP1	NP2	NP1	NP2	
apologize	31	2	29	1	n.s.
accuse	21	15	19	8	n.s.
forgive	7	21	16	7	0.005
criticize	10	21	17	10	0.05
praise	8	20	8	17	n.s.
scold	3	28	19	12	0.001
Total	88	107	107	46	0.001

For *because* sentences, there is a complex interaction between two semantic factors, implicit causality and mood of the sentence, in determining pronoun assignment. Modality either augments or leaves unaffected NP1 type verbs, but has a more dramatic effect on NP2 type verbs. Weak modal auxiliaries reverse the direction of causality implicit in these verbs, while strong modals intensify their original causal valence.

The effect of modality on pronoun assignment in *because* sentences contrasts sharply with its lack of effect in *but* sentences. The number of NP1 and NP2 assignments for *but* sentences appear in Table 3. No reliable differences emerged for individual verbs: all appeared as strong NP1's when

¹ *Praise* patterned like the other NP2 type verbs when the results were combined with the data from the passive and verb-negated sentences. This discrepancy was the only one which emerged when the data were separated.

combined with weak or strong modal auxiliaries. These results reinforce our earlier claim that in *but* sentences the semantics of causality and modality are subordinated to the parallel function strategy in determining the direction of pronoun assignment.

Table 3. *Completions for Strong and Weak Modal Verbs in But Sentences*

Verb	Strong		Weak		p
	NPI	NP2	NPI	NP2	
apologize	29	1	27	6	n.s.
accuse	22	1	28	2	n.s.
forgive	29	2	31	2	n.s.
criticize	39	2	25	2	n.s.
praise	27	3	30	1	n.s.
scold	29	3	28	10	n.s.
Total	175	12	169	23	n.s.

Compellingness

An analysis, peripheral to the question of pronoun assignment, was performed on the explanations generated to actions described in the *because* sentences. Two judges rated each explanation on a five point scale depending upon whether it represented a compelling (5) or inconsequential (1) justification for the subsequent action. A product moment correlation of 0.72 indicated that the judges had substantial agreement in their ratings. Mean compellingness ratings for each modal auxiliary pooled across main verbs appear in Table 4. Sentence fragments containing strong modals (i.e., *ought to*, *must*) evoked more compelling explanations than those containing weak modals (i.e. *may*, *can*). *Should* appears to have been interpreted in its strong form while *will* appears to have received both its weak and strong interpretations.

Table 4. *Mean Compellingness ratings for modal verbs*

<i>ought to</i>	<i>must</i>	<i>should</i>	<i>will</i>	<i>can</i>	<i>may</i>
3.82	3.71	3.64	3.22	2.75	2.57

Discussion

The grammatical subject or sentence-initial NP was selected as the appropriate antecedent for the pronoun in over 70% of all the sentence fragments in the present study. This preference confirms the importance of parallel function in pronominalization: the pronoun in the subject position of the subordinate clause was interpreted as being coreferential with the NP that had the parallel grammatical function in the main clause.

That listeners rely on this general strategy to interpret sentences with potentially ambiguous pronouns is consistent with the necessity for parallel constructions in the other areas of syntax. The unacceptability of the sentence "John and the hammer broke the window" (from Sheldon, 1974) results from the inability to conjoin NP's of different cases. Similarly, any attempt to conjoin a gerund and an infinitive produces unacceptable results as in the sentence "I like to water ski and swimming".

The preference for parallel constructions in pronominalization can be evoked to explain some differences in sentences with $\bar{N}P1$ and NP2 readings.

(12a) John sold the bike to Henry because he needed the money. (NP1)

(12b) John sold the bike to Henry because he could pay cash. (NP2)

The two readings, (12a) and (12b), are not equally amenable to reversals in the order of their clauses. When the order is reversed for (12a), the resulting sentence (13a) is perfectly acceptable while sentence (13b), produced by reversing the clauses in (12b), is much less acceptable.

(13a) Because he needed the money, John sold the bike to Henry.

(13b) Because he could pay cash, John sold the bike to Henry.

According to the Parallel Function Hypothesis, the pronoun in the subject position of the first clause in (13a) is assigned coreferentially with the NP in the subject position of the second clause whereas the same strategy is blocked in (13b).

A further difference is that only NP2 readings appear to be subject to passivization. Passive variants of NP2's are acceptable whereas passive versions of NP1's are questionable, e.g.,

(14a) The prisoner shot the warden because he knew there would be no amnesty. (NP1)

(14b) The warden was shot by the prisoner because he knew there would be no amnesty.

(15a) The warden shot the prisoner because he was trying to escape. (NP2)

(15b) The prisoner was shot by the warden because he was trying to escape.

The asymmetry in the acceptability of passive variants of NP1 and NP2 readings is consistent with the Parallel Function Hypothesis: when the pronoun in the subject position of the subordinate clause is coreferential with the NP that has the same grammatical function in the main clause, the sentence is more acceptable than when it is coreferential with the NP that has a different grammatical function (Sheldon, 1974).

Parallel function and the semantics of verbs

While the strategy of interpreting the pronoun as being coreferential with the grammatical subject of the main clause is adequate to account for the majority of pronoun assignments in the present study, it is limited in its applicability. One restriction on its use arises from the causal valence of the main verb. Recall that implicit causality selects one or the other of the available candidate nouns as primarily responsible for instigating the action expressed in the main clause, and unless some modulating influence is exerted by other linguistic elements, it will assign the pronoun according to the direction established by the verb. When the verb imputes the cause of the event to the object NP, the pronoun is then assigned coreferential with it, in violation of the proposed strategy.

However, the generality of this result is limited to sentence fragments with main verbs unmodified by modal auxiliaries. When modal verbs are introduced, the pattern of pronoun assignment changes. Thus, in *because* sentences in the present study, weak modals reversed the direction of causality for NP2 type verbs (i.e., *criticize*, *scold*, and *forgive*) while strong modals intensified their original causal valence. NP1 type verbs retained their sentence-initial NP assignment when combined with both weak and strong modals. This complex interaction of modality and causality can be rendered meaningful if we consider the logical structure that corresponds to the root sense of the modal verbs.

When dealing with the root interpretation, two noun phrases may be present in the underlying structure of the sentence, one corresponding to the bearer of the obligation (permission) and one corresponding to the source of the obligation (permission) (Lakoff, 1972). In the sentence, "Jill must kiss Jack because he carried her pail of water up the hill", the obligation devolves on Jill but originates from something Jack did. In the present experiment, these two roles appear to function independently of one another to determine pronoun assignment, and which one dominates depends upon whether the modal verb is a strong or a weak one. For weak modals, the bearer of the permission, in active sentences generally the sentence-initial NP, is taken to be the appropriate referent for the pronoun. For strong modals, the source

of the obligation, generally residing in the person to whom the cause of the action is imputed, is taken to be the appropriate referent of the pronoun. Thus, strong modals operate in conjunction with the direction of causality implicit in the main verb to determine pronoun assignment, while weak modals permit the unrestricted use of the PFH strategy for pronoun assignment.

One reason why this pattern of pronoun assignments may have emerged is illustrated by the following examples. Consider the sentence fragment "John may/can scold Bill...". John is permitted to scold Bill but whether or not he does so depends more on his own mood, feelings, physical well-being and/or disposition towards Bill than on what it was that Bill actually did to provoke John's anger. This is in contrast to the situation expressed in the sentence, "John must/ought to scold Bill...". Here, John is obligated to scold Bill but the source of the obligation, or alternatively the cause of the reprimand, arose out of something that Bill did rather than out of something independently conceived of by John. It seems reasonable that in the former case an explanation for the action will involve John (i.e., the bearer of the permission) while in the latter case it will involve Bill (i.e., the source of the obligation). Sentences representative of the type of completion generated in response to the presence of weak and strong modal operators serve to illustrate this point.

- (16) Nancy may scold Marge because she dislikes people who crack their gum.
 (17) Alexander must scold Mark because he disobeys orders continuously.

Whether Nancy in (16) scolds Marge probably depends on some aversion she may have to gum crackers while Alexander's reprimand of Mark in (17) results from Mark's disregard of known rules or conventions.

The qualitative differences inherent in violating idiosyncratic standards of behavior and violating established patterns of behavior are consistent with the qualitative differences obtained in the rated compellingness of the explanations. The presence of weak modal operators evoked much less compelling explanations of the behavior. Thus, not only does the modality of the sentence interact with the implicit causality of the main verb to determine pronoun assignment, but it also determines how compelling an antecedent event must be to "justify" a subsequent action.

Parallel Function and the semantics of but

The combination of modality and implicit causality in *because* sentences can restrict the possible readings for a potentially ambiguous pronoun, thus

rendering the NP1 interpretation predicted by the PFH strategy less likely. The presence of the connective *but*, however, virtually guarantees the production of a parallel construction in the subordinate clause. In *but* sentences, the first noun phrase was overwhelmingly selected as the appropriate referent for the pronoun, regardless of the causal valence of the verb and the type of modal that modified it. It appears that a strategy involving parallel constructions is triggered by the presence of *but*. We expected that this strategy would involve the use of *but* referred to as “denial of expectation” (Lakoff, 1971) and that it would result in a very specific type of completion for the situation described in the main clause. Consider the sentence “John is tall but he’s no good at basketball” (from Lakoff, 1971). This sentence consists of an assertion and a presupposition. The presupposition resides in the speaker’s knowledge of the world and involves the expectation that someone who is tall is good at basketball. The presence of *but* in the sentence signals the denial of this presupposition.

Evidence that a strategy based on denial of expectation is operating in the present study is available from the completions that were generated to *but* sentence fragments.

- (18) Joseph can scold Michael but he has no reason to.
 (19) Christine must apologize to Linda but she doesn’t have to be sincere.
 (20) Lawrence may praise Nick but he doesn’t have to like him.

In sentence (18), a presupposition that is part of the lexical description of the verb is being denied (Fillmore, 1971); when a person scolds someone else, it is because he believes that the individual is responsible for some blameworthy action. In sentences (19) and (20), the presuppositions being denied are less directly a part of the semantics of the verbs than a part of what we know in general about the acts of apologizing and praising. A person apologizing to someone is usually presumed to be sincere in his request for forgiveness unless, of course, he has some ulterior motive. And, people usually do not shower other people with praise unless they like them. The strategy based on denial of expectation produced another type of completion in which the action expressed in the main clause was explicitly denied. These completions took the form of elliptical sentences, for example, “Jennifer should criticize Beverly but she won’t”.²

²The semantics of *but* resulted in a slightly different type of completion for sentence fragments in which the verb was explicitly negated. Moreover, the alternative action was related in a very consistent way to the negated one. This pattern can be seen in some completions representative of ones that were negated.

- (21) Matilda must not accuse Dorothy but she
 (a) will spread vicious rumors.
 (b) will give her dirty looks.

Conclusion

The PFH strategy proposed for pronoun assignment is similar to the basic perceptual strategies proposed by Bever (1970) to underlie the comprehension of sentences. These perceptual strategies map external sequences of words onto internal structures. For example, Bever claims that listeners first isolate adjacent clauses in the surface structure of the sentence consisting of Noun-Verb-Noun (NVN) sequences which could potentially correspond to sentences in the underlying structure. This strategy is so compelling that subjects in an immediate comprehension task could not avoid assuming that an NVN sequence in the surface structure corresponded to a clause in the underlying structure even when explicitly instructed that this interpretation was incorrect.

It is our contention that the PFH strategy proposed for pronoun assignment is a basic perceptual strategy that underlies the comprehension of sentences which have a potentially ambiguous pronoun in the subject position of a subordinate clause. Listeners readily interpret the pronoun as being co-referential with the NP that has the same grammatical function because of a predilection for parallel constructions. Just as semantic constraints may require the reassignment of internal structure to the lexical items in a NVN sequence initially assigned by a basic perceptual strategy, so too may semantic factors such as causality and modality require the reassignment of the pronoun to the NP which does not have the same grammatical function.

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Résumé

Des sujets ont complété des phrases de la forme *NP1 aux V NP2 because (but) Pro...* (e.g., John peut réprimander Bill parce qu'il...) en apportant une raison ou un motif à l'action décrite dans la première partie. On émit l'hypothèse selon laquelle une stratégie perceptuelle de base était sous-jacente à la compréhension des phrases qui comportent un pronom potentiellement ambigu en position sujet dans la proposition subordonnée. Il fut prédit que des auditeurs interprèteraient le pronom comme étant coréférentiel avec le NP sujet de la proposition principale, i.e., le NP possédant la même fonction grammaticale. Alors même que cette stratégie a rendu compte de la plus grande partie des résultats, des facteurs sémantiques ont limité son utilisation en provoquant une interprétation dans laquelle le pronom était coréférentiel avec le NP objet de la phrase principale.